

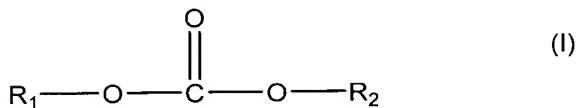
REMARKS

Claims 21-44 are currently pending in the present application.

Applicants wish to extend their appreciation to Examiner Tischler for withdrawing the objection and rejections under 35 U.S.C. §§ 101, 112 (second paragraph), 102(b) and 103(a).

The rejections under 35 U.S.C. § 103(a) of: (1) claims 21-24, 28-32 and 35-38 as being obvious over Shingo (JP 11-080418) in view of Cohen (U.S. Patent 4,405,394) and Vogel (U.S. Patent 5,532,023); (2) claims 25 and 26 as being obvious over Shingo in view of Cohen, Vogel and Masahide (JP 11-005865); and (3) claims 26, 27, 33, 34 and 39-44 as being obvious over Shingo in view of Cohen, Vogel and Peters (U.S. Patent 5,232,954), are respectfully traversed.

Claim 21 recites a process for recycling expanded polystyrene comprising: volume reduction of expanded polystyrene by dissolution in a solution comprising a dialkyl carbonate, or a blend of dialkyl carbonates, having the following general formula (I):



wherein R₁ and R₂ are the same or different and each independently represent a linear, a branched or a cyclic alkyl radical having from 1 to 12 carbon atoms, and the sum of the carbon atoms of R₁ and R₂ is from 2 to 15; removal of an insoluble component, if present; *selective precipitation of polystyrene with a non-solvent, wherein the non-solvent is an alkylene carbonate, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate;* separation of precipitated polystyrene; and drying of precipitated polystyrene.

Shingo, Cohen, Vogel, Masahide and Peters, when considered alone or in combination, fail to disclose or suggest the claimed process for recycling expanded polystyrene comprising selective precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate.

Assuming *arguendo* that sufficient motivation and guidance is considered to have been provided by Shingo, Cohen, Vogel, Masahide and/or Peters to arrive at the process of the present invention, which is clearly not the case, such a case of obviousness is rebutted by a showing of unexpected results.

Unlike the claimed invention, Shingo describes a process for recycling foamed polystyrene comprising precipitating polystyrene with a lower alcohol as the sole non-solvent (See e.g., abstract, [0011], claims 2 and 5).

Unlike the claimed invention, Cohen describes a process for laminating a photosensitive layer to a substrate in the manufacture of printed circuit boards, wherein the photosensitive layer comprises a thermoplastic polymer, wherein the substrate comprises aluminum or copper, and wherein said process comprises in sequential order: cleaning a substrate surface; applying a thin layer of a liquid to the substrate surface to form an interface between the substrate surface and the photosensitive layer; and displacing the liquid from the interface by absorption into the photosensitive layer during lamination (See e.g., abstract, column 1, lines 9-16 and 51-68, column 2, lines 1-3, column 3, lines 16-19). Cohen lists polystyrene among a plethora of various polymers that may constitute the thermoplastic polymer included in the photosensitive layer (See e.g., column 5, lines 34-68, column 6, lines 1-56). Cohen describes that the liquid may be a solvent or a non-solvent liquid, wherein non-solvent liquids may include water, fluorocarbons, aqueous and fluorocarbon solutions of alcohols, alkoxyalkanols and alkylene carbonates, and aqueous solutions of heterocyclic compounds or chelating agents (See e.g., column 2, lines 44-46, column 3, lines 8-13). Cohen describes that *particularly preferred* non-solvent liquids are aqueous solutions of methanol or ethanol (See e.g., column 3, lines 14-15).

Unlike the claimed invention, Vogel describes a method for reducing wrinkles on clothing fabric with a wrinkle reducing composition comprising: a silicone compound; a film-forming polymer; and a liquid carrier, wherein the wrinkle reducing composition is substantially free of starch, modified

starch and mixtures thereof (See e.g., abstract, column 1, lines 5-8 and 55-63, column 2, lines 4-11).

Vogel lists styrene among a plethora of various monomers that may constitute the film-forming polymer (See e.g., column 4, lines 40-64, column 5, lines 1-11). Vogel describes that preferred monomers are selected from the group consisting of vinyl alcohol, vinylpyrrolidone, acrylic acid, dimethylaminoethyl methacrylate, ethyl acrylate, methyl methacrylate, methacrylic acid, diethylenetriamine, vinyl pyridine, adipic acid, mixtures and copolymers thereof (See e.g., column 5, lines 11-15, column 26-52, column 7, lines 38-67, column 8, lines 1-16). Vogel describes that the liquid carrier is preferably an aqueous system comprising water (See e.g., column 12, lines 54-57). Vogel describes that the aqueous liquid carrier may optionally, but not preferably, contain a low molecular weight organic solvent that is highly soluble in water, including C₁-C₄ monohydric alcohols (e.g., ethanol, propanol, isopropanol), C₂-C₆ polyhydric alcohols (e.g., alkylene glycols, polyalkylene glycols), alkylene carbonates and mixtures thereof (See e.g., column 12, lines 58-64). Vogel describes that the particularly preferred liquid carrier is distilled water, deionized water or tap water (See e.g., column 12, lines 64-67).

Unlike the claimed invention, Masahide describes a carbonate compound for dissolving polystyrene (See e.g., abstract).

Unlike the claimed invention, Peters describes a process for recovering polystyrene comprising precipitating polystyrene with an alcohol as the sole non-solvent (See e.g., column 4, lines 25-38).

Applicants respectfully submit that contrary to page 10, lines 6-8 of the Official Action, a skilled artisan would not have been motivated to combine Shingo with the clearly unrelated references of Cohen and Vogel, since Shingo is directed to a process for recycling foamed polystyrene, whereas Cohen is directed to a process for laminating a photosensitive layer to a substrate in the manufacture of printed circuit boards and Vogel is directed to a method for reducing wrinkles on clothing fabric.

Applicants further submit that even if sufficient motivation and guidance is considered to exist for a skilled artisan to combine Shingo with the clearly unrelated references of Cohen and Vogel, a

skilled artisan would not have arrived at the process of the present invention comprising selective precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, as presently claimed, absent impermissible hindsight reconstruction.

Contrary to the process of the present invention, which involves selective precipitation of polystyrene with an alkylene carbonate non-solvent or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, Cohen describes that the liquid is to be “absorbed” into the photosensitive thermoplastic polymer layer. Cohen fails to provide a skilled artisan with sufficient motivation and guidance to particularly select the claimed polystyrene from the tremendously large genus of thermoplastic polymers described therein. Cohen also fails to provide a skilled artisan with sufficient motivation and guidance to particularly select an alkylene carbonate non-solvent or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, as presently claimed, from the various solvent and non-solvent liquids, or the particularly preferred aqueous solutions of methanol or ethanol, described therein. Contrary to page 9, last paragraph of the Official Action, Cohen also fails to disclose or suggest a non-solvent liquid comprising a mixture of an alcohol and an alkylene carbonate.

Contrary to the process of the present invention, which involves selective precipitation of polystyrene with an alkylene carbonate non-solvent or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, Vogel describes that the liquid is a “carrier” of the film-forming polymer, which is a term recognized by those of ordinary skill in the art to mean a substance that facilitates the transport or delivery of another substance. Applicants respectfully submit that Vogel fails to provide a skilled artisan with sufficient motivation and guidance to particularly select the claimed polystyrene from either the tremendously large genus of film-forming polymers, or the particularly preferred film-forming polymers, described therein. Applicants respectfully submit that Vogel teaches away from utilizing alkylene carbonates or alcoholic blends thereof because Vogel explicitly discloses that the particularly preferred liquid carrier is water and that the aqueous liquid carrier preferably does not

contain C₁-C₄ monohydric alcohols (e.g., ethanol, propanol, isopropanol), C₂-C₆ polyhydric alcohols (e.g., alkylene glycols, polyalkylene glycols), alkylene carbonates and mixtures thereof.

Applicants respectfully submit that contrary to page 9, last paragraph of the Official Action, a skilled artisan would immediately recognize that alcohols are not, in fact, “equivalent” to alkylene carbonates. A person of ordinary skill in the art would readily appreciate that an alcohol is fundamentally different from an alkylene carbonate in that an alcohol is a compound having a hydroxyl group (-OH) (e.g., ethanol), whereas an alkylene carbonate is a carbonate ester compound having a carbonyl group (C=O) flanked by two alkoxy groups (-OR) (e.g., ethylene carbonate).

Therefore, even if a skilled artisan were to combine Shingo with the clearly unrelated references of Cohen, which describes absorbing an aqueous solution of methanol or ethanol into a photosensitive layer that may comprise various thermoplastic polymers in the manufacture of printed circuit boards, and Vogel, which describes that water serves as a liquid carrier for various film-forming polymers in a method for reducing wrinkles on clothing fabric, a skilled artisan would not have arrived at the selective precipitation of polystyrene with an alkylene carbonate non-solvent or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, in accordance with the process of the present invention, absent impermissible hindsight reconstruction.

Assuming *arguendo* that sufficient motivation and guidance is considered to have been provided by Shingo, Cohen, Vogel, Masahide and/or Peters to arrive at the claimed process for recycling expanded polystyrene comprising selective precipitation of polystyrene with an alkylene carbonate non-solvent or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, which is clearly not the case, such a case of obviousness is rebutted by a showing of unexpected results.

As shown in Table 1 below, which compiles into tabular form the experimental data presented in Example 22 and Comparative Example 20 of the present application, Applicants have discovered that the process of the present invention, which may involve selective precipitation of polystyrene with

a blend of non-solvents consisting of an alcohol and an alkylene carbonate as shown in Example 22, unexpectedly exhibited superior properties with respect to surprisingly enhanced efficacy in the removal of impurities during the recycling of expanded polystyrene, as compared to the inferior properties exhibited by the conventional process of Comparative Example 20, as described in Shingo and Peters, which involves precipitation of polystyrene with an alcohol as the sole non-solvent.

Example	Non-Sovent(s)	Recycled Expanded Polystyrene	
		% Bromine Removed	% Dicumyl Peroxide Removed
Ex. 22	n-butanol and propylene carbonate	94	98
Comp. Ex. 20	n-butanol	61	92

This evidence clearly demonstrates that a process involving selective precipitation of polystyrene with a blend of non-solvents consisting of an alcohol and an alkylene carbonate in accordance with an exemplary aspect of the present invention, unexpectedly exhibited superior properties with respect to surprisingly enhanced efficacy in the removal of impurities during the recycling of expanded polystyrene, as compared to the inferior properties exhibited by the conventional processes described in Shingo and Peters, which involve precipitation of polystyrene with an alcohol as the sole non-solvent.

Withdrawal of these grounds of rejection is respectfully requested.

In conclusion, Applicants submit that the present application is now in condition for allowance and notification to this effect is earnestly solicited.

Respectfully submitted,

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